# A/E/C CADD and Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE)

**May 2005**

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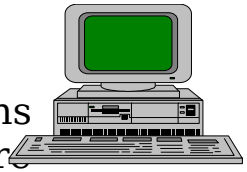
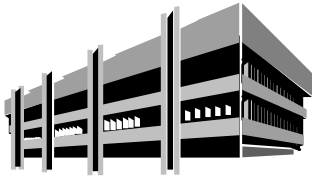
# Life Cycle Project Data Model

## Disposal
BRAC

## Planning
Master Plans
Base Closure
NEPA Reports
RPMA
Natural/Cultural Resources

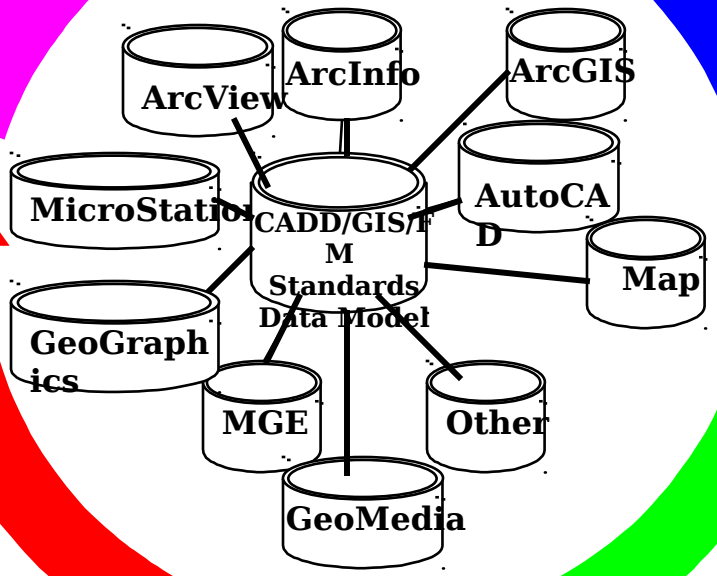


SDSFIE



## Maintenance
AIS
Work Orders
Installation Restoration

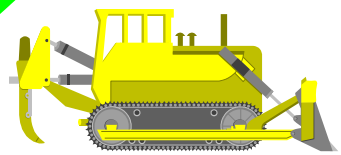
SDSFIE & FMSFIE



## Design
Plans & Specifications

A/E/C CADD Std

## Construction
As-Builts
Shop Dwgs



## Operations (Base/Mil)
ISR
Mobilization Plans
Environmental Compliance
Emergency Response
Range Management

# CADD/GIS Standards:

## Military

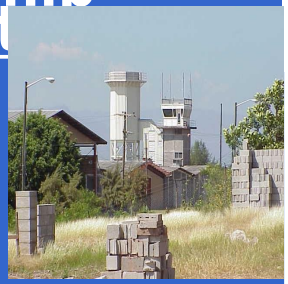
- Military construction
- Base operations
- Environmental restoration
- Geospatial Engineering

## Homeland Security

- Critical Infrastructure
- Anti-Terrorism
- Force Protection
- Infrastructure Security
- Interagency Partnership

## Support

- USGS
- FBI
- NASA
- NIMA
- Smithsonian



## Research & Development

- Military engineering
- Terrain & Geospatial
- Structures
- Environment
- W

## Civil

- Navigation, Hydropower
- Flood control, Shore Protection
- Water Supply, Regulatory
- Recreation, Disaster response

## Real Estate

- Acquire, manage & dispose
- DOD Recruiting facilities
- Contingency

## ***Working Below the Line***

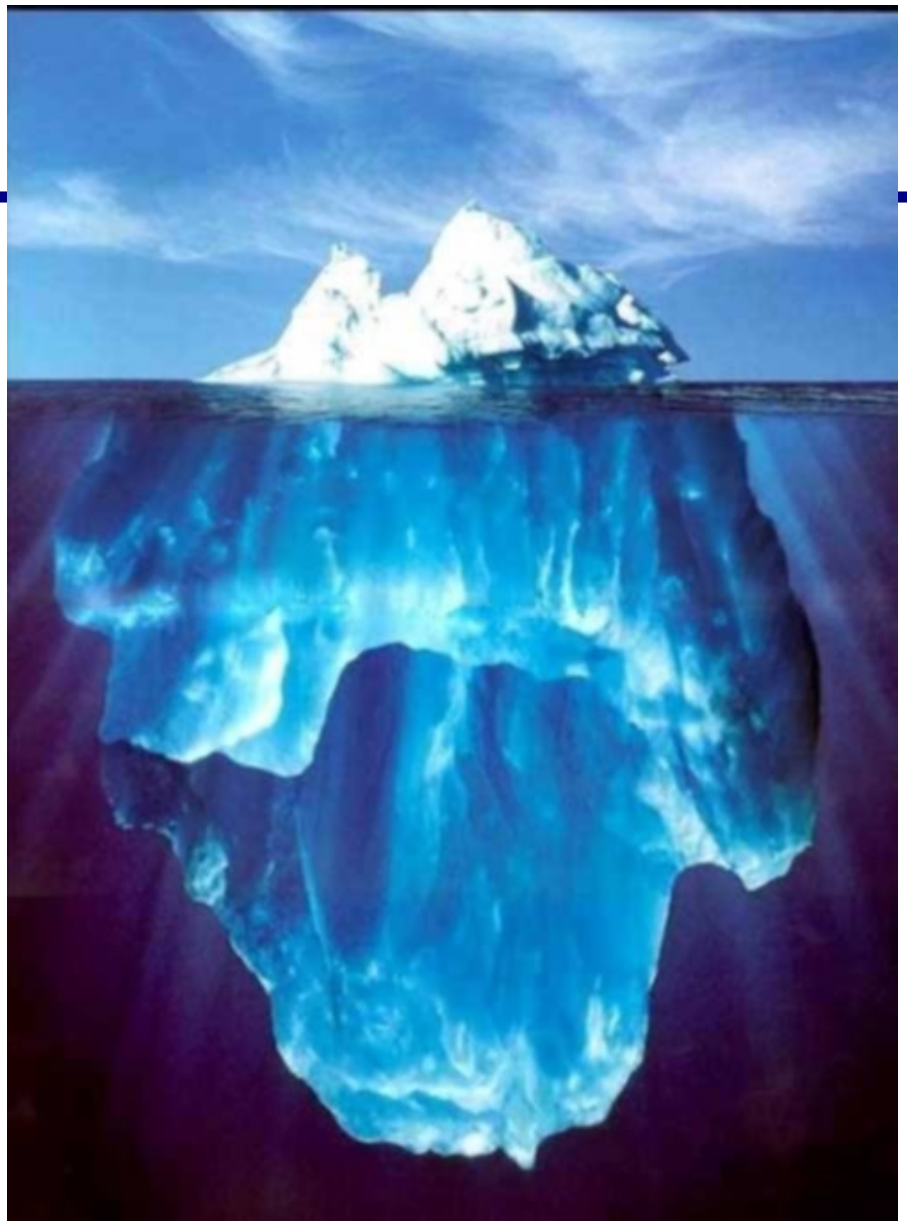
Database Design/Schema

Data Content Standards

Schema Development Tools

Business Rules

CADD/GIS Object



# CADD/GIS

## Fundamentally different technologies

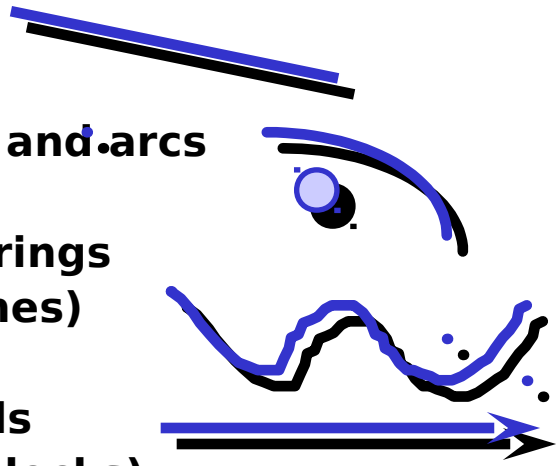
- CADD - technology for symbolically representing features (dumb graphics) Inside the building
- GIS - database Net Centric, analytical methodology for working geographically with both graphic and non-graphic data

  Outside the Building

# Data Elements

## CADD

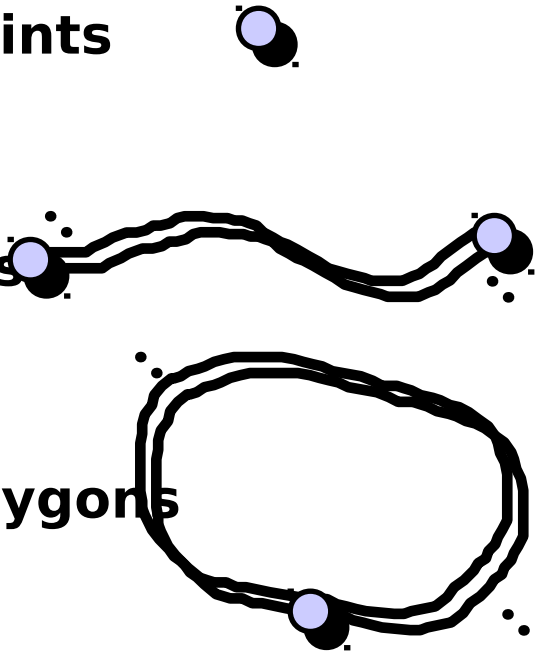
- Lines
- Circles and arcs
- Line strings (polylines)
- Symbols (cells/blocks)
- Text
- etc.



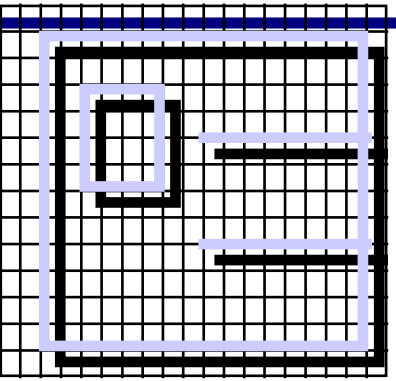
Room 30

## GIS

- Nodes / Points
- Lines / Arcs
- Areas / Polygons



# Data Structure



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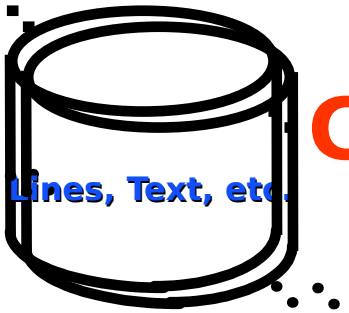
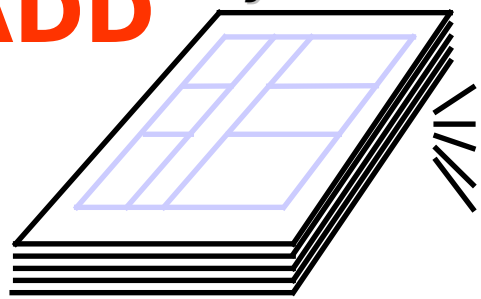



Graphic Data Files

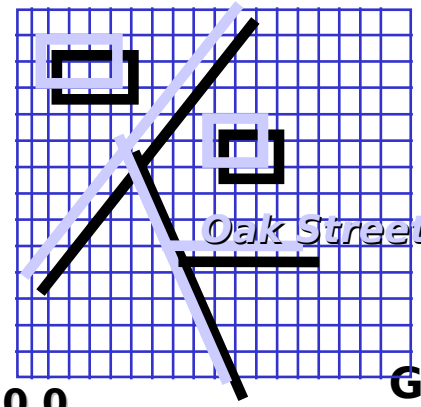
**CADD**

Data arranged by *layers/levels* and by drawing file.



Floorplan Layer
Dimensions Lay
Symbols Layer
Border Layer
etc.

Data referenced to a *Cartesian XYZ two or three* dimensional coordinate system

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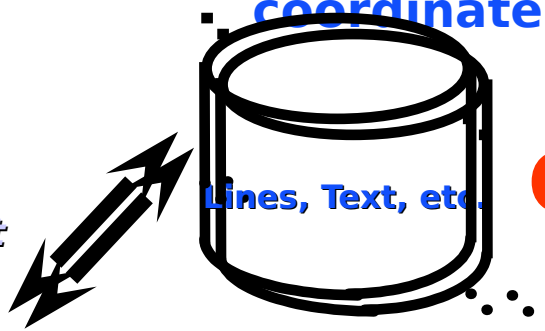
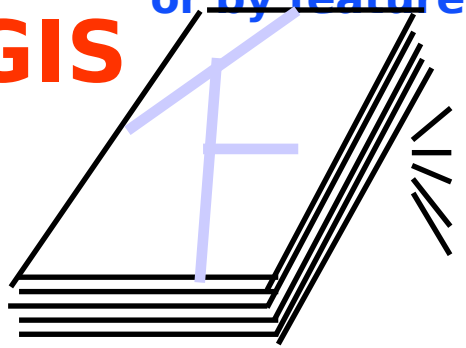



Graphic Data Files OR
*Database Records*

**GIS**

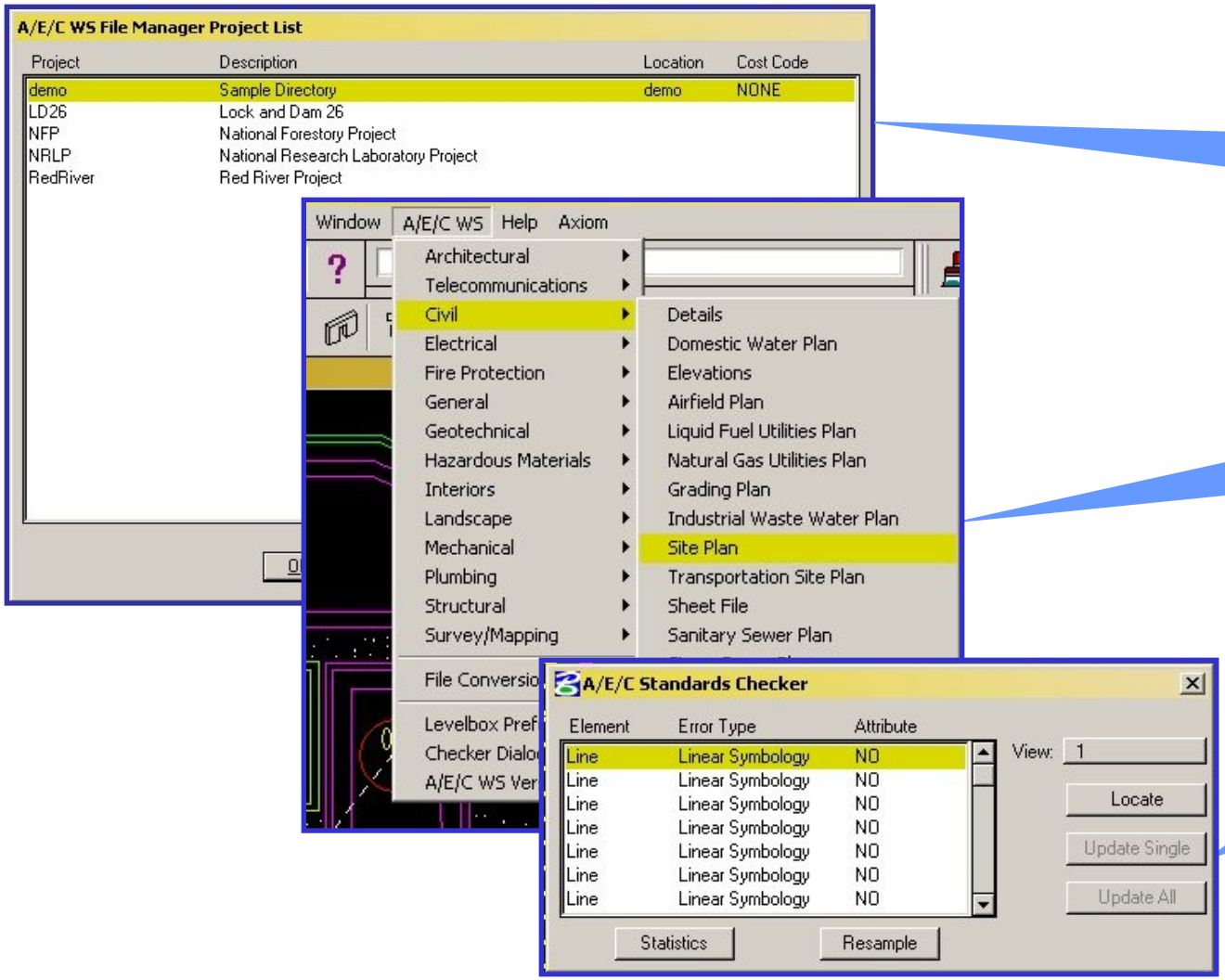
Data arranged by *themes* (map shee file),
or by features (coverage file)



Roads File
Structures File
Water System Fil
Boundaries File
etc.

referenced to a *Projected XYZ two or three* dimensional coordinate sys

# A/E/C CADD Standard Workspace




- **Uniform File Naming**
- **Consistent Data Entry**
- **Data Checking**
- **Data Sharing**

# Geospatial Data Set

## FEATURE/ ATTRIBUTE/

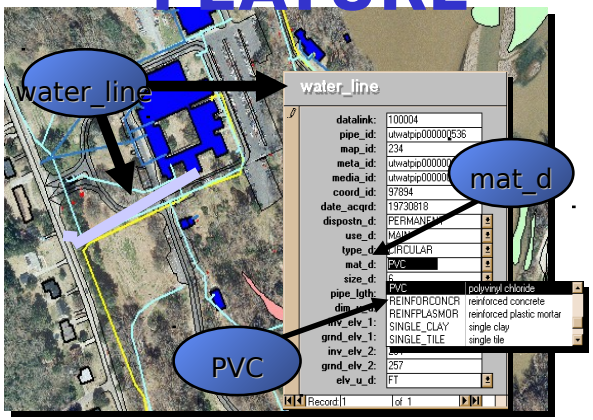
| MSLINK | WATPIPE_ID | MAPID | DISPOSTN_D | USE_D | TYPE_D | MAT_D | SIZE_D | INSTLN_ID |
|---|---|---|---|---|---|---|---|---|
| 1083 | 1036 | 66 | | MAIN | | PVC | 4 | WES |
| 1038 | 1038 | 66 | | MAIN | | PVC | 4 | WES |
| 222 | 222 | 66 | | SERVICE | | GLASS | 2" | WES |
| 652 | 652 | 66 | | SERVICE | | PVC | 6 | WES |
| 1037 | 1037 | 66 | | SERVICE | | COPPER | 2" | WES |
| 959 | 959 | 66 | | SERVICE | | CASTIRON | 6 | WES |
| 894 | 894 | 66 | | SERVICE | | GLASS | 2" | WES |
| 896 | 896 | 66 | | SERVICE | | GLASS | 2" | WES |
| 899 | 899 | 66 | | SERVICE | | GLASS | 3 | WES |
| 649 | 649 | 66 | | MAIN | | PVC | 6 | WES |
| 660 | 660 | 66 | | MAIN | | PVC | 6 | WES |
| 666 | 666 | 66 | | MAIN | | PVC | 6 | WES |
| 569 | 569 | 66 | | MAIN | | PLASTIC | 6 | WES |
| 582 | 582 | 66 | | SERVICE | | PVC | 6 | WES |
| 584 | 584 | 66 | | SERVICE | | PVC | 2" | WES |
| 770 | 770 | 66 | | SERVICE | | PVC | 2" | WES |
| 139 | 139 | 66 | | SERVICE | | PVC | 2" | WES |
| 209 | 209 | 66 | | MAIN | | PVC | 6 | WES |
| 214 | 214 | 66 | | SERVICE | | PVC | 6 | WES |
| 217 | 217 | 66 | | SERVICE | | PVC | 6 | WES |
| 221 | 221 | 66 | | SERVICE | | GLASS | 2" | WES |
| 1032 | 1032 | 66 | | MAIN | | CASTIRON | 6 | WES |
| 41 | 41 | 66 | | SERVICE | | GLASS | 1.5 | WES |
| 26 | 26 | 66 | | SERVICE | | GLASS | 6 | WES |
| 658 | 658 | 66 | | MAIN | | PVC | 6 | WES |
| 895 | 895 | 66 | | SERVICE | | GLASS | 2" | WES |
| 900 | 900 | 66 | | SERVICE | | GLASS | 3 | WES |
| 665 | 665 | 66 | | MAIN | | PVC | 6 | WES |
| 664 | 664 | 66 | | MAIN | | CASTIRON | 6 | WES |
| 640 | 640 | 66 | | SERVICE | | GLASS | 3 | WES |

+

## SPATIAL GEOMETRY

=

## GEOSPATIAL FEATURE




**SDS-compliant Relational database**

**ESRI/Intergraph AutoDesk/Bentley**

**SDS-compliant GIS**

# Spatial Data Standards for
## Facilities, Infrastructure, and Environment

- Provide a standard for geographic information system (GIS) implementations at DoD Air Force, Army, and Navy installations, and Army Corps of Engineers Civil Works activities, state & local governments.
- Provide a "nonproprietary" GIS standard for use with commercially available "off-the-shelf" CADD, GIS, and relational database software.
- Provide a GIS implementation schema for approved Federal Geographic Data Committee (FGDC) Data Standards.

# Entity Sets

- Broad grouping for data management purposes
- Entity Sets (26 Themes in SDSFIE Release 2.31)

**Landform**
**Geology**
**Soil**
**Hydrography**
**Transportation**
**Flora**
**Fauna**
**Operations**
**Climate**
**Visual**
**Common**
**Olfactory**
**Auditory**
**Cultural**
**Land Status**
**Buildings**
**Improvements**
**Utilities**
**Communications**
**Boundary**
**Cadastre**
**Geodesy**
**Demographics**
**Military**
**Ecology**

# SDSFIE Relational Data Model

| *Entity Set* | *Entity Class* | *Entity Type* | *Attribute* | *Domain* |
|---|---|---|---|---|
| Utilities | Water System | **SDTS (FIPS 173) Data Model** | | |
| | Natural Gas | | | |
| | Wastewater | Drain Sump | | |
| | | Grease Trap | | |
| | | Septic Tank | Capacity | |
| | | | Age | |
| | | | Composition | Concrete |
| | | | | Fiberglass |
| | | | | Steel |

# CADD and GIS Objects – The Paradigm Shift

*Objects allow us to change our approach to design*

*from*

"Drawing a collection of lines, arcs and circles" = CAD Geometry

*to*

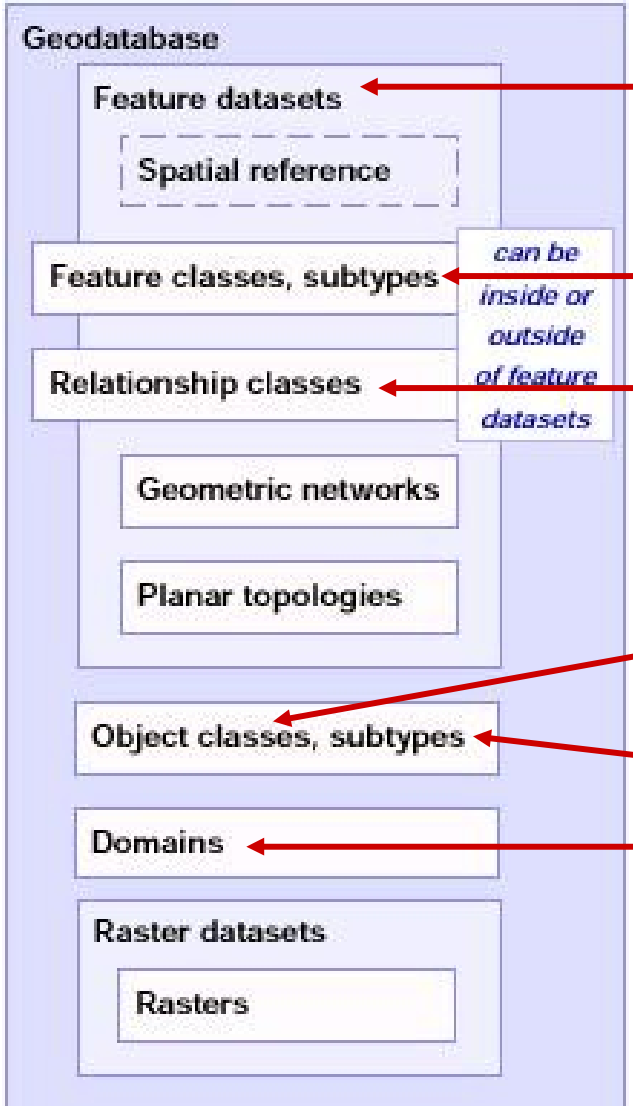
"Assembling objects in space"

= Intelligent Building Models and greater GIS capability

# Objects Create "Intelligent" Project Data

- Properties
  - Fire Rating, Cost, Flow rate, Color, Fan speed, etc.
- Behaviors
  - Maximum treads between landings, Minimum headroom, etc.
- Graphical Representation
  - Different views (plan, elevation, section) for a single object
- Relationships
  - Parents and Children

# SDSFIE Geodatabase




SDSFIE Entity Set/Entity Classes

SDSFIE Entity Types

SDSFIE Joins/Relationships

SDSFIE non-graphic tables

SDSFIE discriminators +

SDSFIE domain tables

# Sources

- OSD
  - CD-RPIReqs Book Final 1-19-05.doc  (Section 3)
  - Attachment D RPI Core Data Element Detail Report
  - Attachment E RPI Logical Data Model
  - Attachment F RPI Common Data Model v2.1a
  - Attachment G RP AAV 1_18 Process Model
- FGDC Cadastral Data Model
- SDSFIE Release 2.40

# 21 OSD Crosswalks

1. There were 21 OSD features.
2. There were 30 FGDC features.
3. Five of these features were the same.
4. These five,  are currently in SDSFIE Release 2.40.

# 21 OSD Crosswalks

| OSD | FGDC Cadastral | SDSFIE Entity Type | SDSFIE SI |
|---|---|---|---|
| Organization | Organization / Public Agency | | Agency |
| Person | Source / Transaction Agent | | POC |
| Address | | | Address |
| Site | | installation_area | |
| ***Installation*** | | | |
| ***Site-Base-Realignment-And-Closure*** | | | |
| Geopolitical Spatial Area | Geopolitical Area / Geopolitical Legal Area | | |
| political_jurisdiction_area | | | |
| Space | | building_space_area | |
| ***Real-Property-Asset-Module*** | | | |
| Real-Property-Facility | | | Facility |

# 21 OSD Crosswalks

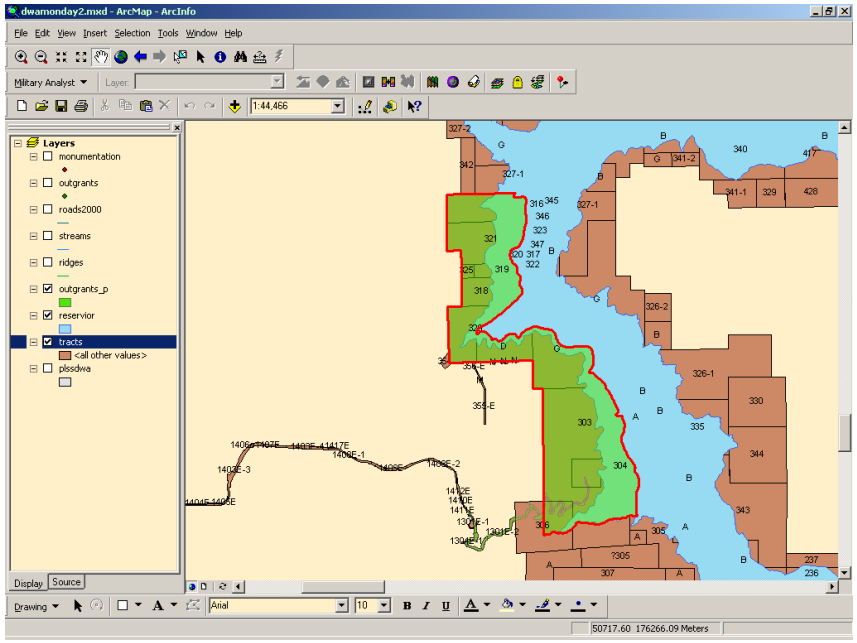
| OSD | FGDC Cadastral | SDSFIE Entity Type | SDSFIE SI |
|---|---|---|---|
| Document | Transaction Document | | Media |
| Property - Acquisition | | acquisition_boundary_area | |
| Property - Disposal | | land_disposal_area | |
| Real-Property-Grant | | outgrant_site | |
| Project | | | Project |
| Facility-Construction | | construction_site | |
| Land-Parcel | Legal Area Record Boundary / Parcel / Parcel Area / Parcel Legal Area / Parcel Record Boundary | parcel_area | |
| ***BRAC-Site*** | | | |
| Instrument-Real-Property-Asset | | | Instrument |
| Measurement domain | | | UOM |

# Recommendations

1. Establish a policies/requirements for RPIR and SDSFIE usage/modifications.
2. Establish an aliases for OSD Feature Site and other features
   - SDSFIE installation_area
3. Add 2 OSD features to the SDSFIE
   - BRAC-Site
   - Site-Base-Realignment-And-Closure
4. Add 2 OSD tables to the SDSFIE
   - Installation and Real-Property-Asset-Module
5. Evaluate the NILS data model/system/applications for Corps use

# Questions

## The Technology is Here today
## Where is the Beef (money)



# Questions

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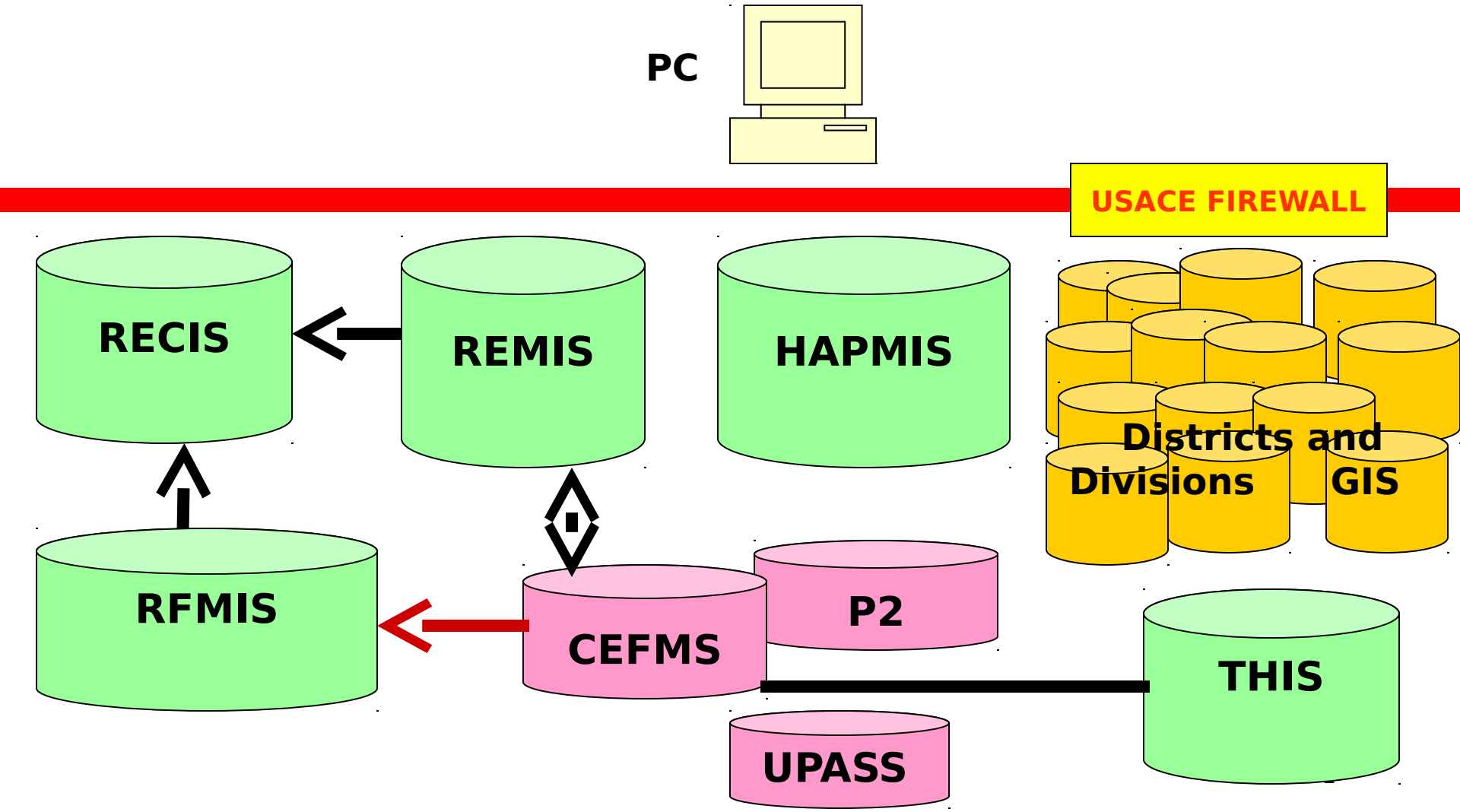
CADD/GIS Technology Center Internet URL :
http://tsc.wes.army.mil

# Problems/Issues
# ~~Real Estate AIS's~~

- **Current Real Estate System AIS's are "data-centric" should be "business-centric"**
- **Multiple databases instead of central databases**
- **Duplicate data entry across AIS's**
- **Each District has there own GIS / CADD data sets**

  **Some District use CADD others GIS**
- **Real Estate data is Geographic information. Current AIS's do <u>not</u> have <u>CADD/GIS capability</u>.**
- **Real Property Inventory requires a geospatially based AIS**
- **Current Real Estate AIS's are not integrated**

# Real Estate Current Connectivity



# A Proposed Real Estate Technical Architecture